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CLAIMS

1. Method for determining a load vector acting on a rolling element bearing (1), in which the method comprises:

5   measuring displacement and/or strain using N sensors (8) for determining displacement and/or strain in a ring shaped element (5, 6, 7) of the rolling element bearing (1);

determining a deformation of the element (5, 6, 7) by calculating amplitude and phase of N/2 Fourier terms representing at least one radial mode shape of the ring

10   shaped element (5, 6, 7);

feeding the N/2 Fourier terms to a bearing neural network (12), the bearing neural network (12) being trained to provide the load vector on the rolling element bearing (1) from the N/2 Fourier terms.

15   2. Method according to claim 1, in which the rolling element bearing (1) comprises two rows of coaxial bearings (1, 1'), the ring shaped element of the rolling element bearing being the bearing outer ring (5) of one of the two rows of coaxial bearings (1, 1').

20   3. Method according to claim 1 or 2, in which the N sensors (8) comprise strain sensors, and the at least one radial mode shape comprises a mode shape of order zero and one or more mode shapes of order two or higher.

4. Method according to claim 1 or 2, in which the N sensors (8) comprise

25   displacement sensors, and the at least one radial mode shape comprises one or more mode shapes of order zero and higher.

5. Method according to one of the claims 1 through 4, further comprising determining N/2 Chebyshev polynomial coefficients from the N sensor signals,

30   representing at least one axial mode shape of the ring shaped element (5, 6, 7).

6. Method according to one of the claims 1 through 5, in which the bearing neural network (12) is trained using a plurality of data sets, each data set comprising a

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predefined load vector on a specific type of rolling element bearing (1) and associated measurement data from the N sensors (8).

7. Sensor arrangement for determining a load vector acting on a rolling element bearing (1) in operation, the sensor arrangement comprising

a plurality of N sensors (8) which measure displacement and/or strain for determining displacement and/or strain in one of the elements (5, 6, 7) of the rolling element bearing (1);

a mode shape coefficients calculator (11), connected to the plurality of N sensors (8), for determining a deformation of the element (5, 6, 7) by calculating amplitude and phase of N/2 Fourier terms representing at least one radial mode shape of the ring shaped element (5, 6, 7);

a bearing neural network (12), connected to the mode shape coefficients calculator (11), the bearing neural network (12) being trained to provide the load vector on the rolling element bearing (1) from the N/2 Fourier terms.

8. Sensor arrangement according to claim 7, in which the rolling element bearing (1) comprises two rows of coaxial bearings (1, 1'), the ring shaped element of the rolling element bearing being the bearing outer ring (5) of one of the two rows of coaxial bearings (1, 1').

9. Sensor arrangement according to claim 7 or 8, in which the N sensors (8) comprise strain sensors, and the at least one radial mode shape comprises a mode shape of order zero and one or more mode shapes of order two or higher.

10. Sensor arrangement according to claim 7 or 8, in which the N sensors (8) comprise displacement sensors, and the at least one radial mode shape comprises one or more mode shapes of order zero and higher.

11. Sensor arrangement according to one of the claims 7 through 10, in which the mode shape coefficient calculator (11) is further arranged to determine N/2 Chebyshev polynomial coefficients representing at least one axial mode shape of the ring shaped element (5, 6, 7).

12. Sensor arrangement according to one of the claims 7 through 11, in which the bearing neural network (12) is trained using a plurality of data sets, each data set comprising a predefined load vector on a specific type of rolling element bearing (1) and associated measurement data from the N sensors (8).

13. Sensor arrangement according to one of the claims 7 through 12, in which the bearing inner ring (6) or outer ring (5) are attached to a sensor holder (2), a circumferential recession (3) being provided between at least part of the contacting surfaces of the inner ring (6) or outer ring (5) and the sensor holder (2).

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